An Advanced, Compact, Ultraviolet Imaging Spectrometer for Planetary Systems (AUVIS)

Completed Technology Project (2016 - 2018)

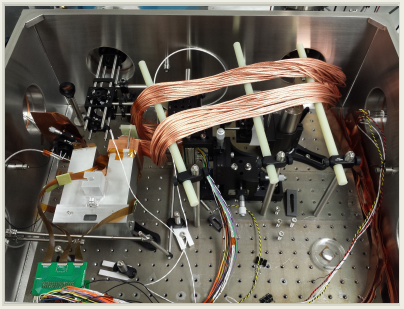
Project Introduction

A compact, high throughput ultraviolet imaging spectrometer is under development. This instrument is enabled primarily by several technology development areas for example in efficiency, high dynamic range detectors. This development will enable higher science return from spectrometer instruments in future planetary missions.

The Advanced, Compact, Ultraviolet Imaging Spectrometer for Planetary Systems will improve ultraviolet imaging spectrometers in throughput while reducing the volume, mass, and voltage requirements of the spectrometer. This advanced instrument is enabled by three technology areas: 1) the high efficiency, photon counting silicon detector arrays namely delta doped and custom-coated electron multiplying charge coupled devices (EMCCD), 2) high reflectivity coatings and solar blind filters using atomic layer deposition (ALD) and 3) electron-beam fabricated convex ultraviolet grating. In addition to the better efficiency, this detector does not require high voltage or high power for operation. This development will help to reduce design risks associated with the mass and power required to operate the detector. The detector is a solid-state photon counting array that has high efficiency and high dynamic range in the far UV wavelengths. This detector would replace the microchannel plate detectors currently used by existing ultraviolet spectrometers.

Anticipated Benefits

Ultraviolet spectrometers have been present on many planetary missions to collect scientific data on the atmospheres and surfaces of various targets such as the planets, moons, comets and asteroids. Improving the efficiency and dynamic range of the detector in instrument such as a spectrometer will help to collect additional scientific data as well as relax the stringent requirements on spacecraft navigation which can help reduce mission costs. Additionally, being solid state, these detectors do not require high voltage for operation. Using these high efficiency solid state detectors reduces the risks involved in using the image-tube-based detectors that require high voltage.



Test chamber with prototype spectrometers mounted.

Table of Contents

Project Introduction	1
Anticipated Benefits	1
Primary U.S. Work Locations and Key Partners	2
Organizational Responsibility	2
Project Management	2
Images	3
Technology Maturity (TRL)	3
Technology Areas	3
Target Destination	3
Supported Mission Type	3

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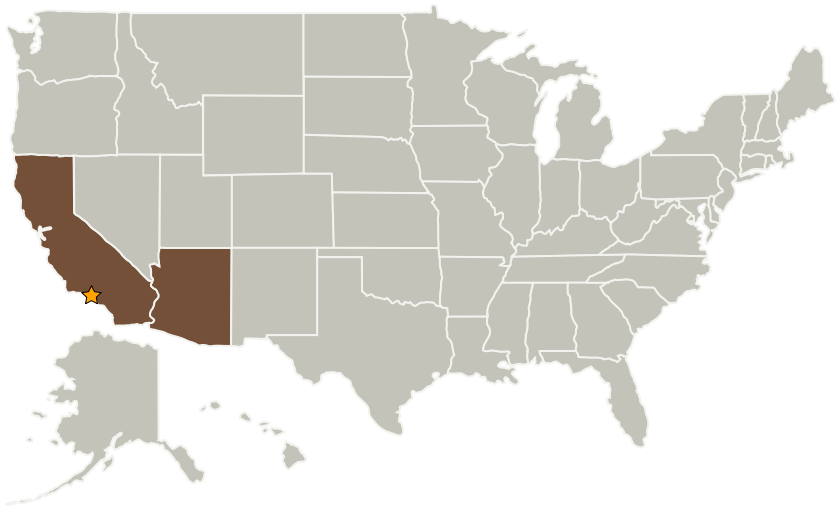
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
Arizona	California

Organizational Responsibility

Responsible Mission Directorate:

Mission Support Directorate (MSD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Center Independent Research & Development: JPL IRAD

Project Management

Program Manager:

Fred Y Hadaegh

Project Manager:

Fred Y Hadaegh

Principal Investigator:

Shouleh Nikzad

Co-Investigators:

Alexander G Carver
Walter M Harris
Pantazis Mouroulis
Daniel W Wilson

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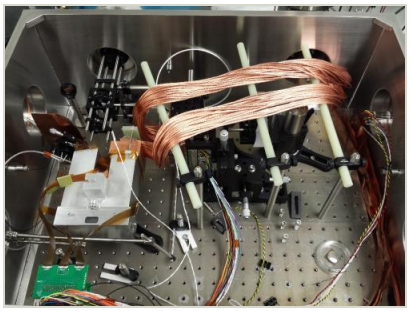
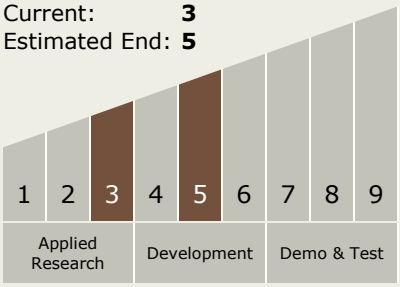
Images



JPL_IRAD_Activities Project Image
Test chamber with prototype spectrometers mounted.
(https://techport.nasa.gov/image/27989)

Technology Maturity (TRL)

Start: **3**
Current: **3**
Estimated End: **5**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.1 Detectors and Focal Planes

Target Destination

Others Inside the Solar System

Supported Mission Type

Push